# 7. Conclusion: Constructionism and Virtual Communities

This chapter will present a number of open questions for further research, and then summarize the contributions of this thesis.

## 7.1 Open Research Questions

### 7.1.1 The Social Implications of Distributed Systems

MOOSE Crossing runs on a single, centralized server. A distributed model is preferable for both social and technical reasons.

From a technical perspective, a distributed model is necessary for scalability. A centralized server will always be limited by the memory, speed, and disk capacity of the machine it runs on. A system implemented on a distributed architecture can grow many orders of magnitude bigger—perhaps indefinitely. Expansion simply requires additional machines.

This technical change has potentially large social implications. A centralized-server model usually implies centralized control over most policy decisions affecting the community. On MOOSE Crossing and MediaMOO, I make the rules. This includes deciding who gets to be a member of the community, what counts as acceptable conduct, how much each person can build in the virtual world, and even whether the system continues to operate at all. (In other words, it's my sandbox.) MediaMOO briefly experimented with democratic control, but that experiment failed. Part of the reason the experiment failed is the difficulty of avoiding the fundamental fact that the person who controls the hardware and software has ultimate control over the system.[1] If the server is distributed, social control over the virtual world might be more effectively distributed. Everyone could have his or her own small piece of the world, and make the rules for that piece of the world. (Everyone could have his or her own sandbox.)

[1] This is only one of many reasons the experiment failed. Few if any of the active participants had any background in political science, and many mistakes were made. I began the experiment by establishing a voting mechanism to chose an elected council, and left it up to the newly-elected representatives to decide how the council would operate. The new council members chose a consensus-based decision making process, which proved unwieldy and vulnerable to being manipulated by minority interests. Making even minor decisions proved time consuming and difficult, and the elected council members found that the process was taking a great deal of time and emotional energy for little reward. Discussion of even trivial issues became heated as factions began to fight one another for purely political rather than substantive reasons. I tried to make the elected council take on more responsibility and authority than they were willing to accept, and then interfered too much in the process by continuing to participate in ongoing discussions of issues. Early on in the experiment, the not-yet-developed political process was put to a tough test by an accusation of sexual harassment made by a council member against a member of the community. This led to a voluminous, heated, and acrimonious debate which contributed to establishing a hostile atmosphere surrounding the entire political process. Eventually, the council voted to dismantle the experiment and return to autocratic rule.

Distributed architectures do not necessarily imply distributed control over decision making. For example, Fujitsu's WorldsAway graphical world is implemented on a distributed software base for reasons of scalability, but Fujitsu retains complete control over all design decisions, just as is usually the case in single-server models. Distributed architectures do, however, make it much easier to establish distributed social control, where it is desired.

If the economic and technical barriers to establishing your own little piece of the virtual world remain relatively high, then the system that emerges will not be radically different from what exists today. Communities will be more interconnected, and will need to negotiate border issues. Gateways between separate servers may be invisible to the user, or they may come with customs stations checking that you are authorized for access, are not carrying any prohibited objects, and agree to abide by the local rules and regulations. However, overall, things will not be very different.

As the barriers to having your own corner of the virtual world drop, the nature of the medium will likely begin to change more radically. What will be the impact of democratization of control? Will many people want to have their own corner of cyberspace? If so, what will they do there? Are realms run by individuals subject to any broader laws? Whose laws apply? Are there any civil rights in cyberspace? The nature of the social changes this technological shift will facilitate is an intriguing question for further research.

### 7.1.2 The Cognitive Implications of Graphical Media

Many people who visit the Epistemology and Learning Group at the Media Lab are initially surprised to see that MOOSE Crossing is a text-based system. Isn't this the *Media* Lab, they wonder? After they've seen the children's projects, they are usually charmed. The children are using words imaginatively and expressively, developing a new understanding of and love for the written word. After a class in California had been using MOOSE Crossing for a few months, I called their teacher on the phone and asked how things were going. Her first comment was that she couldn't believe the improvement in her students' writing. The students are devoting significant energy to writing, and to revising their writing. They really seem to care about the outcome, because they want to show it off to their peers. For this particular application, the text-based medium supports rich learning experiences.

For many other applications, other media types are preferable. For example, members of MediaMOO would be able to communicate more fluently with one another if they could do so by voice. An educational system designed to promote visual expressiveness would of course be better in a graphical medium. A media type should be chosen by analyzing the unique requirements of each design situation.

Unfortunately, many designers chose to use the flashiest medium possible, regardless of the goals of a specific application. The benefits of text need to be explained to people seeing it for the first time; graphics are more immediately accepted. The initial threshold to using graphical media is often lower, but the limit on what you can ultimately accomplish with it is often lower as well. People seeking commercial success with new media are particularly vulnerable to choosing the highest production values possible to maximize immediate appeal, regardless of the real requirements of the situation.

In reality, higher production values are not always more commercially successful. Fujitsu's WorldsAway two-and-a-half-dimensional virtual world has been much more popular and financially successful than its three-dimensional competitors like AlphaWorld and WorldsChat by Worlds, Inc.[2] One likely reason is that WorldsAway has stronger support for human communication. While AlphaWorld may look much fancier, in WorldsAway your avatar has a wider range of body language and emotional states. Since this medium is ultimately about interpersonal communication, WorldsAway has greater appeal to users than its slicker but less expressive competitors.

This is not an argument in favor of text, or against high production values. It's an argument in favor of the appropriate use of media, and against using graphical media solely for surface appeal.

As of 1997, text-based MUDs are used for many virtual world applications that would be better off being graphical. The reasons are largely economic—most text-based MUD servers are given away for free, are easy to run, and require no computing power on the client side. They can be accessed from almost any computer with any kind of net connection. For many applications such as hack-n-slash games, graphical media are preferable, and will likely replace text-based media in the near future. For example, Diablo by Blizzard Entertainment is a networked Dungeons-and-Dragons-like game which has very quickly gained popularity, with over 5000 players participating each night only a few months after its release. Graphical media offer significant advantages for this application, and it's likely that commercial graphical systems will dominate over freeware text-based systems in the near future.

For educational MUDs, text continues to have pedagogical advantages. However, as children's media companies begin to design large-scale online services, it's inevitable for marketing reasons that those services will be graphical.

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[2] This information is from an unconfirmed source.

Currently available graphical systems are much less intellectually engaging than text-based ones. The ability of text-based worlds to encourage creative writing is only part of the reason. Text-based worlds allow users to construct new spaces, and program objects with behaviors. Few graphical worlds allow users to build, and none that I know of created to date (March 1997) allow users to program.

While current graphical technology is less intellectually engaging, this does not have to remain the case. This leads to an intriguing set of design questions. The goal of the design of the MOOSE language and MacMOOSE client was to make the text-based medium more intellectually engaging. How could graphical media be enriched in this fashion? What new learning experiences can graphical media support? Given the inevitability of media for children and adults becoming increasingly graphical, this is an important set of research questions to address in the future.

### 7.1.3 Gender, Technology, and Learning Styles

In the spring of 1992, I bumped into Mitchel Resnick (who was at that time still a graduate student, but about to become a faculty member) in the hallway by the Media Lab's back elevator. I had recently given a presentation about my research into social and psychological phenomena in MUDs to the Media Lab's Narrative-Intelligence Reading Group. That original work was done as a term paper for a course on the sociology of science and technology with Sherry Turkle. My main research at that time was still on interactive cinema. In the hallway, Mitch asked me: What do you think of the idea of making a MUD based on the *Babysitters' Club* series of books to encourage girls to be interested in computing? That was the beginning of what would later become the MOOSE Crossing project—the initial motivation was to explore ideas about gender and computing.

*The Babysitters' Club* is a series of books for young adults published by Scholastic Books that are enormously popular with girls. While that theme might help attract girls, it also seemed a bit restrictive to the imaginative possibilities a virtual world might offer. A theme based on the PBS television show *Ghostwriter* was considered, but also dismissed for similar reasons. I wanted something that would appeal to both girls and boys, and would be fairly open-ended, allowing children to construct anything they imagined. MicroMUSE's theme of the city of the future struck me as being a bit too masculine. On the other hand, a *Babysitters' Club* MUD seemed to go too far in the other direction. The project had no name until June 1993, when I sent this email to a few friends and colleagues:

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Subject: The social construction of MOOSE
Date: Fri, 25 Jun 93 10:13:56 -0400
From: asb@media.mit.edu

I'm getting awfully tired of referring to "the MUD for kids" and "the
scripting language we're designing."  Names are needed.  And
yesterday I had this wonderful/terrible idea: it's a MOO Scripting
Environment, right?  That sounds like MOOSE to me! So the language
would be called MOOSE.  The place would be called "MOOSE Crossing."
It's a crossing of ways for many different sorts of people.

When you connect, you're at the intersection of two roads.  One way
leads to the city.  Another leads to the country.  There's one tree
in the middle of the clearing.  Dangling from the tree is a horn.  If
you blow the horn, the moose will come.  The moose is a program which
tries to be helpful and answer questions.  When it hasn't been
summoned, it wanders around (usually in the forest, behind the
clearing.)  If you climb the tree, you get to a tree house. If you
climb past the tree house up into the clouds, you get to a kind of
fantasy land.  This is just a place where kids can build new areas
based on whatever fantasy themes they like.  Over all, this is just a
core structure for the kids to build off of.

So here's the gender question:
Clearly we wouldn't want to call a MUD designed to encourage girls to
be excited about computers "racetrack," "boxing rink," or "the
tower."  But I also don't want to call it "teddy bear place,"
"unicorn land," or "rainbow home."  I want something gender neutral
leaning a touch towards the feminine, but not corny.  Does "MOOSE
Crossing" fit the bill?

-- Amy

p.s.  Clearly, the moose is a female moose.  (Does that mean no
antlers?)  What is her name?
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The idea of having a programmatic moose was later abandoned as unnecessary, but otherwise the structure of the virtual world ended up pretty much as described above.

The idea of making MOOSE Crossing a girls-only environment was considered, and rejected for a variety of reasons. I thought it would be more interesting to construct an environment for both girls and boys, and see whether they reacted differently to it. Additionally, although I'm not fully versed in the literature on single-sex education, my inclination is against it. Girls need to learn to function effectively in the real world, and this includes the presence of boys and men in almost all social contexts. For these reasons, MOOSE Crossing was made a co-ed environment, and its agenda of investigating gender and computing was not announced to participants.

As time went on, gender issues faded in prominence on the research agenda. There seemed to be so much to understand about phenomena like community, construction, and learning in the environment. Gender seemed more appropriate for a follow-on study.

Another reason for delaying research on gender on MOOSE Crossing is methodological. An ethnographic methodology uses detailed observation of particular individuals to try to understand broader phenomena. In the case of studying learning, this methodology seemed appropriate. Applying this approach to the study of gender is more problematic. In examining small groups of individuals, how can we understand what factors are attributable to individuals' personalities, and what factors are correlated with gender?

More quantitative approaches are also problematic. It's difficult to develop a rich understanding of human social behavior from such an approach. We have done some statistical analysis of data recorded on MOOSE Crossing. We divided commands issued into the categories of movement, scripting, looking, help, object manipulation, communication, etc. and compared results for boys and girls.[3] There were no statistically significant differences (See Figure 7.1). Overall, girls and boys appear to be using this medium in the same general ways.

Anecdotally, one teacher of a MOOSE Crossing program at a private school in Minnesota reported that the girls were initially much more interested in MOOSE Crossing than the boys. During this time, the children were creating objects and rooms, spending most of their time writing; no one in the class knew how to write programs. Austina Vainius and I visited the class, and showed the students how to write some simple programs. During that session, the boys and girls appeared to have equal interest. The teacher was quite surprised at the difference from previous sessions. (At the time of this writing, it's not yet clear whether the boys' increased interest will persist over time.)

Of the children who are members of MOOSE Crossing, 44% are girls and 56% are boys. This is a slightly higher percentage of female participants than has been reported for the net in general. Reports of the percentage of women online vary. A survey by the Nielsen company reports that 34% of people going online for the first time in 1995 were female; that percentage rose to 42% in 1997 (Bray 1997). (MOOSE members all joined during this time period.)

It's interesting to break these percentages down by where they (or their parents) heard about MOOSE Crossing and where they connect to MOOSE Crossing. This data is summarized in Table 7.1 and Figure 7.2. When MOOSE is presented to children in the context of a school or after-school

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[3]MIT student Austina Vainius did this data analysis, working on the project under the auspices of MIT's Undergraduate Research Opportunities Program (UROP).

program, girls and boys participate in roughly equal numbers. Kids who heard about MOOSE from a friend are equally split along gender lines. Likewise, educational researchers who heard about MOOSE Crossing in a professional context bring an almost equal number of girls and boys to the community (slightly more girls). Data from one girls-only after school program is separated out.

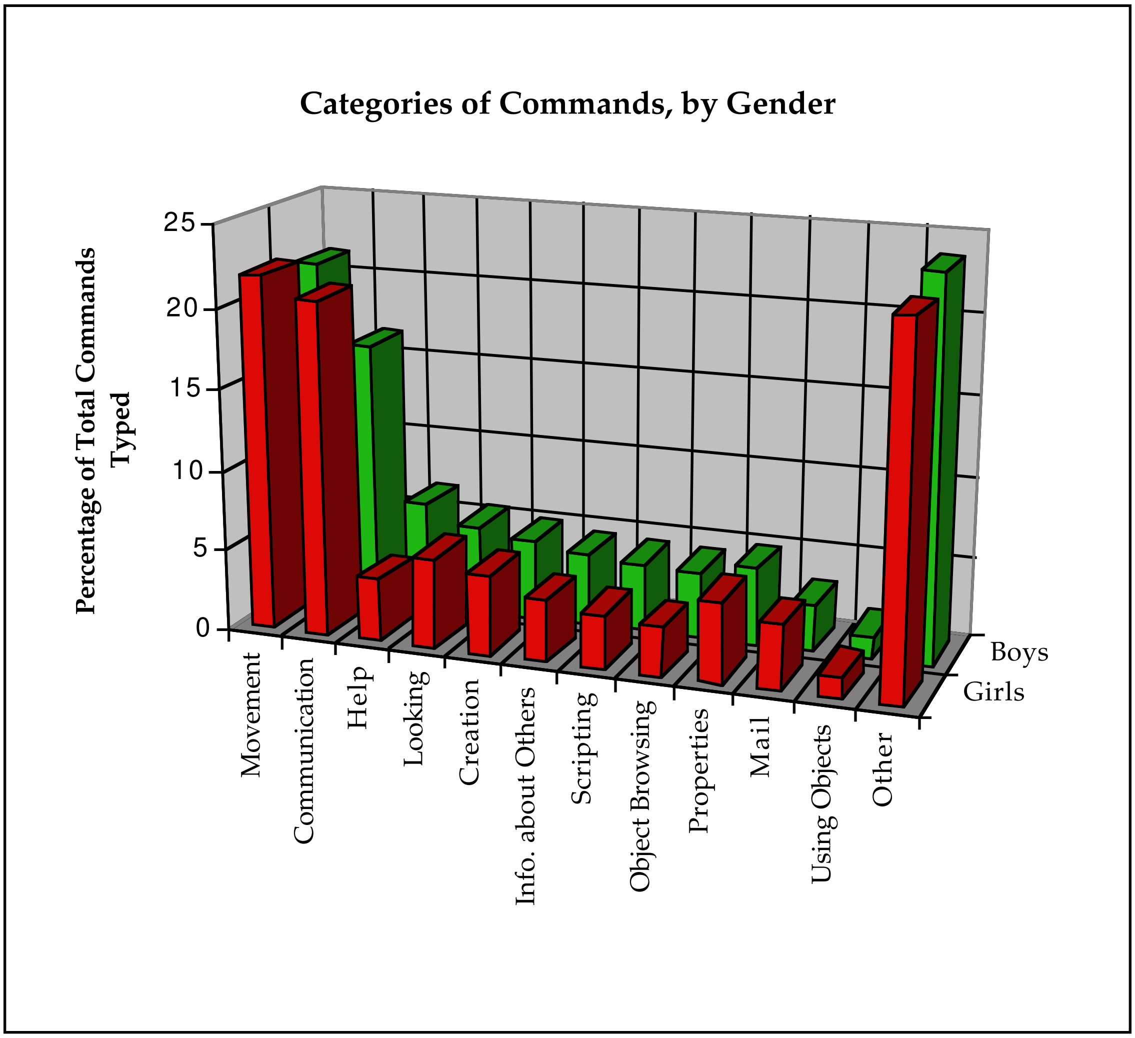


Figure 7.1: Categories of Commands, by Gender

The only gender-unbalanced category is that of kids who heard about MOOSE Crossing via the media (i.e. the popular press, mailing lists, or the web.) More boys are enthusiastic to try MOOSE Crossing and more parents of boys actively seek this educational opportunity for their children than parents of girls. However, usage data indicate that girls tend to like MOOSE Crossing as much as boys. The number of commands typed broken down by gender are presented in Table 7.2. Once they become members, girls and boys participate to a fairly equal degree—the mean number of commands typed is slightly higher for boys, but the median is higher for girls. People expect that boys will like this kind of activity more, but in reality girls and boys like it equally. Our expectations of children's behaviors are more gender-stereotyped than their actual behaviors.

Both ethnographic and statistical methods are limited in their ability to analyze gender-related phenomena. Justine Cassell suggests that a composite methodology where ethnography is used to further explore hypotheses generated by statistical data analysis may be more fruitful. More research is needed to understand gendered phenomena on MOOSE Crossing and in other computational environments.

**How Kids Heard About MOOSE Crossing by Gender**

**Media (i.e. popular press, web, mailing lists)**
Girls: 10 (29%)
Boys: 25 (71%)

**Research Community**
Girls: 15 (54%)
Boys: 13 (46%)

**School**
Girls: 28 (47%)
Boys: 32 (53%)

**Friend**
Girls: 5 (50%)
Boys: 5 (50%)

**Girls-Only After-School Program**
Girls: 9 (100%)
Boys: 0 (0%)

**Other**
Girls: 5 (50%)
Boys: 5 (50%)

Table 7.1: How Kids Heard About MOOSE Crossing, by Gender

| Commands Typed Per Child by Gender | | |
|---|---|---|
| | Median | Mean |
| Girls: | 354 | 2808 |
| Boys: | 390 | 2139 |
| Both: | 375 | 2440 |

Table 7.2: Commands Typed Per Child, by Gender

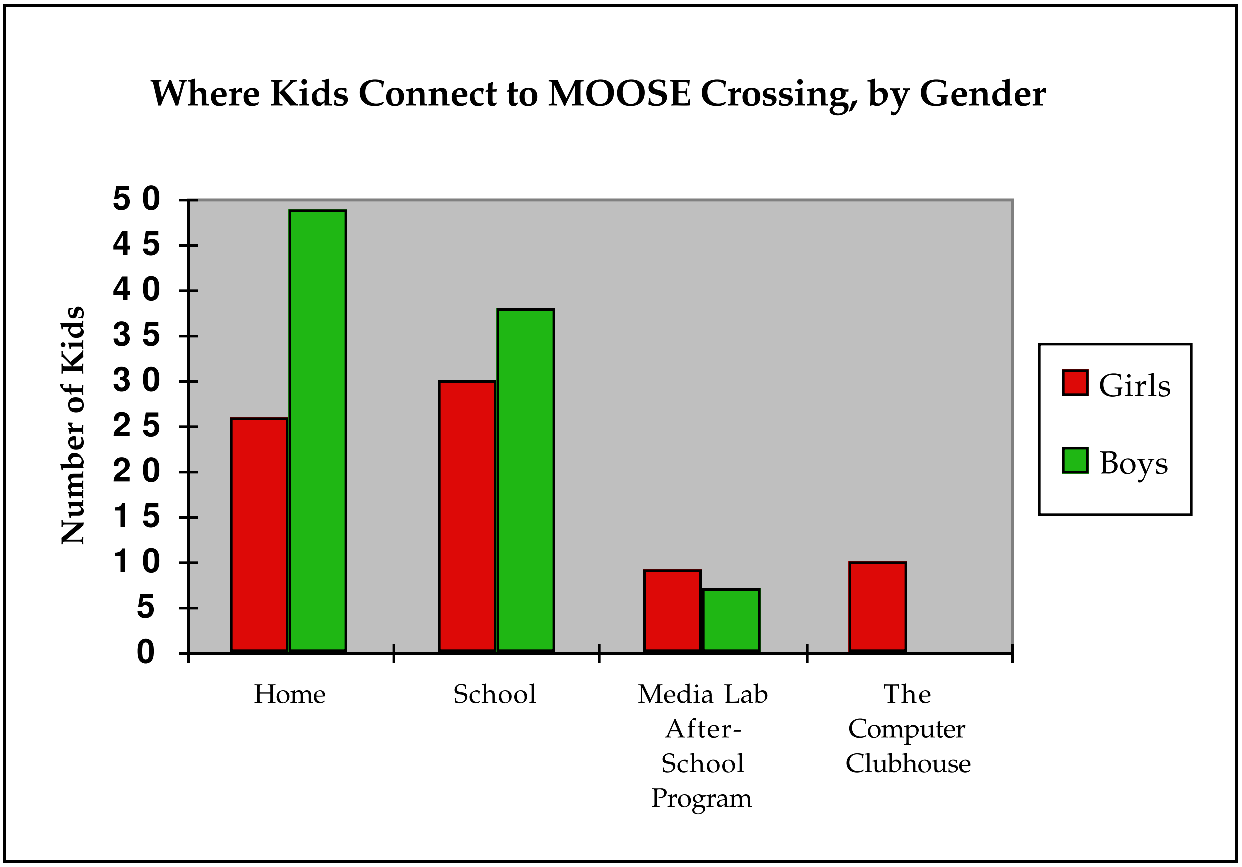


Figure 7.2: Where Kids Connect to MOOSE Crossing, by Gender

## 7.2 Contributions

The primary contributions of this thesis are:

- The creation of a working "technological samba school."
- An articulation of design principles for computer languages (and other technologies) for kids.

- Elucidation of the mutually supportive relationship between construction activities and community, particularly:
  - — An expansion of fundamental understanding of "constructionist" learning, particularly the essential role played by community support for that learning.
  - — An exploration of how constructionism can enhance virtual communities.

This last point is of key importance. The Internet is becoming an increasingly important part of how we work, play, and learn. It remains an open question to what extent communities on the Internet will empower their users. At a colloquium speech at The Media Lab in 1996, David Kurlander, author of Microsoft's Comic Chat client, had a bullet point on one of his slides that said "chat is inane." He smiled and moved on to the next point as if what he had just said was simply a fact of life to accept. Chat is not necessarily inane. Furthermore, interactions among groups of people online can be much more than chat. A constructionist approach to the design of those communities can help to make them more valuable to their members.

A constructionist approach to virtual community design:

- Seeks to maximize each individual's opportunities for creative expression and active participation.
- Starts with the assumption that average people are smarter and more creative than is often assumed, and can achieve great things if given a supportive context to do so. (Applied to software design this is the antithesis of "idiot proofing.")
- Provides well-designed software tools which have a low initial barrier to use, and a high ceiling for what can be accomplished with them.
- Encourages users to be creators of content, maintaining overall quality by enforcing a minimal set of community standards and establishing a distinction between private space and public space.
- Provide opportunities and infrastructure for community support for learning.

In a paper commissioned for the Getty Museum's Art History Information Program, I wrote:

> Cyberspace is not Disneyland. It's not a polished, perfect place built by professional designers for the public to obediently wait on line to passively experience. It's more like a finger-painting party. Everyone is making things, there's paint everywhere, and most work only a parent would love. Here and there, works emerge that most people would agree are achievements of note. The rich variety of work reflects the diversity of participants. And everyone would agree, the creative

> process and the ability for self expression matter more than the product. (Bruckman 1995)

This is a rather different vision than what many designers of corporate web sites have in mind. The Disneyland metaphor dominates the design of many sites whose goal is to display products and services in the best possible light. But the Internet can and will be more than a marketing tool. A constructionist approach can help to make virtual communities empowering for their members, helping groups of people to accomplish what individuals can not accomplish alone.